Complete Summary

GUIDELINE TITLE

Practice parameters for the indications for polysomnography and related procedures: an update for 2005.

BIBLIOGRAPHIC SOURCE(S)

Kushida CA, Littner MR, Morgenthaler T, Alessi CA, Bailey D, Coleman J Jr, Friedman L, Hirshkowitz M, Kapen S, Kramer M, Lee-Chiong T, Loube DL, Owens J, Pancer JP, Wise M. Practice parameters for the indications for polysomnography and related procedures: an update for 2005. Sleep 2005 Apr 1;28(4):499-521. [150 references] PubMed

GUIDELINE STATUS

This is the current release of this guideline.

This guideline updates a previous version: Practice parameters for the indications for polysomnography and related procedures. Polysomnography Task Force, American Sleep Disorders Association Standards of Practice Committee. Sleep 1997 Jun;20(6):406-22.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

- Sleep-related breathing disorders (SRBD), including:
  - Apneas, hypoapneas, and respiratory effort related arousals (RERAs) including Obstructive Sleep Apnea Syndrome (OSA), Central Sleep Apnea Syndrome (CSA), Cheyne-Stokes Respiration (CSR), Alveolar

Hypoventilation Syndrome (AHS), and Upper Airway Resistance Syndrome (UARS)
- Other respiratory disorders including chronic lung diseases and disorders associated with chronic alveolar hypoventilation and hypoxemia
    - Narcolepsy
    - Parasomnias and seizure disorders
    - Restless legs syndrome
    - Periodic limb movement sleep disorder
    - Depression with insomnia
    - Circadian rhythm sleep disorder

GUIDELINE CATEGORY

Diagnosis

CLINICAL SPECIALTY

Family Practice
Internal Medicine
Neurology
Psychiatry
Sleep Medicine

INTENDED USERS

Physicians

GUIDELINE OBJECTIVE(S)

To reissue, modify and, if necessary, replace recommendations for indications for polysomnography (PSG) and related procedures based on the scientific literature published since 1997

TARGET POPULATION

Patients suspected of having sleep related breathing disorders (SRBD), other respiratory disorders, narcolepsy, parasomnias and sleep related seizure disorders, restless legs syndrome and periodic limb movement sleep disorder, depression with insomnia, or circadian rhythm sleep disorders

Note: These recommendations mainly pertain to adults, since the indications for polysomnography (PSG) in the diagnosis of sleep disorders in pediatric patients may be different. Nevertheless, the recommendations for some sleep disorders, such as parasomnias and sleep related seizure disorders, are applicable to adult, adolescent, and pediatric patients.

INTERVENTIONS AND PRACTICES CONSIDERED

1. Sleep history and physical examination
    - Snoring, sleepiness, obesity, witnessed apneas
    - Clinical prediction models
    - Heart disease
2. Use of portable monitoring devices

3. Polysomnography (attended), including:
    - Electroencephalography (EEG)
    - Electroculography (EOG)
    - Electromyography (EMG) at chin, anterior tibialis or extensor digitorum
    - Airflow
    - Arterial oxygen saturation
    - Respiratory effort
    - Electrocardiography
    - Heart rate
4. Continuous positive airway pressure (CPAP) titration, bi-level PAP, and auto-titrating PAP
5. Cardiorespiratory sleep studies (attended and unattended)
6. Multiple sleep latency test
7. Oximetry
8. Pulmonary function tests
9. Arterial blood gases
10. Ferritin level, complete blood count, urinalysis, and screening chemistries (restless legs syndrome)
11. Psychiatric evaluation
12. Actigraphy
13. Evaluation of sleep diaries
14. Serum and urinary melatonin levels and twenty-four hour core body temperature levels

MAJOR OUTCOMES CONSIDERED

- Prevalence of sleep related breathing disorders (SRBDs)
- Effectiveness of polysomnography (PSG) in diagnosing SRBDs
- Effectiveness of PSG in evaluation or diagnosis of patients with sleep-related symptoms (e.g., suspected narcolepsy, parasomias, neuromusulcar disorders, sleep disruptions, seizure disorders)

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Primary Sources)
Hand-searches of Published Literature (Secondary Sources)
Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

A literature search was conducted for each of the sleep disorders described in the original guideline document. For each sleep disorder, the methodology for the literature search, review of the literature, and grading of the evidence are discussed in the sections entitled, "Clinical indications for polysomnography and other sleep medicine procedures."

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Level I (Grade A Recommendation): Randomized well-designed trials with low alpha and beta error*

Level II (Grade B Recommendation): Randomized trials with high alpha and beta error*

Level III (Grade C Recommendation): Nonrandomized concurrently controlled studies

Level IV (Grade C Recommendation): Nonrandomized historically controlled studies

Level V (Grade C Recommendation): Case series

*Alpha error refers to the probability (generally set at 95% or greater) that a significant outcome (e.g., $p<0.05$) is not a result of chance occurrence. Beta error refers to the probability (generally set at 80% to 90% or greater) that a nonsignificant result (e.g., $p>0.05$) is the correct conclusion of the study or studies. The estimation of beta error is generally the result of a power analysis. The power analysis includes a sample size analysis to project the size of the study population necessary to ensure that significant differences will be observed if actually present.

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

For each sleep disorder, the methodology for the review of the literature and grading of the evidence is discussed in the sections entitled "Clinical indications for polysomnography and other sleep medicine disorders." Articles were assigned evidence levels (see "Rating Scheme for the Strength of the Evidence"). Evidence tables were developed; the tables list articles with evidence Levels I and II.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

In its 1992 assessment of polysomnography (PSG), the Agency for Health Care Policy and Research concluded that all PSG testing may not require the in-laboratory measurement of every one of the typical parameters. Because it did not have sufficient peer-reviewed evidence to recommend tests other than standard PSG, however, the agency suggested that further research would be

necessary to elucidate any situations in which testing other than in-laboratory standard PSG would be appropriate. The Board of Directors of the American Sleep Disorders Association (now the American Academy of Sleep Medicine [AASM]) charged a task force with reviewing the evidence (that was published both before and after the Agency for Health Care Policy and Research recommendations were made) and with formulating recommendations based upon that evidence.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Levels of Recommendations

Standard: This is a generally accepted patient-care strategy, which reflects a high degree of clinical certainty. The term standard generally implies the use of Level I Evidence, which directly addresses the clinical issue, or overwhelming Level II Evidence.

Guideline: This is a patient-care strategy, which reflects a moderate degree of clinical certainty. The term guideline implies the use of Level II Evidence or a consensus of Level III Evidence.

Option: This is a patient-care strategy, which reflects uncertain clinical use. The term option implies either inconclusive or conflicting evidence or conflicting expert opinion.

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

External Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The Board of Directors of the American Academy of Sleep Medicine (AASM) approved these recommendations.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Levels of recommendations (Standard, Guideline, and Option) and levels of evidence (I-V) are defined at the end of the "Major Recommendations" field.

Diagnosis-Based Recommendations

Unless otherwise specified, these recommendations refer to attended polysomnography (PSG) and attended portable (type 3) cardiorespiratory sleep studies.

Sleep-Related Breathing Disorders (SRBD)

General Evaluation

The evaluation should include a thorough sleep history and a physical examination that includes the respiratory, cardiovascular, and neurologic systems. Although the examiner must pay particular attention to observations regarding snoring, apneas, nocturnal choking or gasping, restlessness, and excessive daytime sleepiness, other aspects of a sleep history cannot be neglected since many patients suffer from more than one sleep disorder (e.g., a concurrent SRBD and restless legs syndrome). In addition, some medical conditions have been associated with increased risk for SRBDs, such as obesity, hypertension, stroke, and congestive heart failure. Because PSG may be used for diagnosis and for titration or evaluation of various treatment modalities, the general evaluation should serve to establish a differential diagnosis of SRBDs, which can then be used to select the appropriate test(s). The general evaluation should therefore take place before any PSG is performed.

Additional Validated Stratification Factors

Please refer to the original guideline document for a discussion on additional validated stratification factors including snoring, sleepiness, obesity, and witnessed apneas; other factors, clinical prediction rules, and neural networks; and portable monitoring devices.

Clinical Indications for Polysomnography and Other Sleep Medicine Procedures

Polysomnography is routinely indicated for the diagnosis of sleep related breathing disorders. (**Standard**)

1. Full-night PSG is recommended for the diagnosis of SRBDs.
2. For patients in the high-pretest-probability stratification group (see sections titled "Snoring, sleepiness, obesity, and witnessed apneas" and "Other factors, clinical prediction rules, and neural networks" and the recommendation below concerning follow-up PSG; sections 4.1.2.1, 4.1.2.2, and 4.1.3(4) of the original guideline document), an attended cardiorespiratory (Type 3) sleep study may be an acceptable alternative to full-night PSG, provided that repeat testing with full-night PSG is permitted for symptomatic patients who have a negative cardiorespiratory sleep study. In the unattended setting, or in patients without qualifications of a high pretest probability stratification, the data does not support the use of these devices. (By using a cardiorespiratory sleep study to test only those patients who are in the high pretest-probability group, the clinician will reduce the probability of false-negative studies so that the need for PSG is lessened as well).
3. In patients where there is strong suspicion of obstructive sleep apnea syndrome (OSA), if other causes for symptoms have been excluded, a second night of diagnostic PSG may be necessary to diagnose the disorder.

Polysomnography is indicated for positive airway pressure (PAP) titration in patients with sleep related breathing disorders. (**Standard**)

1. A full night of PSG with continuous positive airway pressure (CPAP) titration is recommended for patients with a documented diagnosis of a SRBD for whom PAP is warranted.
2. PSG with CPAP titration is appropriate for patients with any of the following results:
    a. A respiratory disturbance index (RDI) of at least 15 per hour, regardless of the patient's symptoms
    b. A respiratory disturbance index of at least 5 per hour in a patient with excessive daytime sleepiness
3. A cardiorespiratory (Type 3) sleep study without electroencephalogram (EEG) recording is not recommended for CPAP titration. CPAP titration should include the ability to perform sleep staging (including documenting rapid eye movement [REM] sleep) and to identify and treat arousals. Even when apnea is eradicated by CPAP, residual hypopneas and respiratory-effort related arousals (RERAs) may require additional titration to determine optimal therapeutic pressures. These additional adjustments require EEG recording.
4. For CPAP titration, a split-night study (initial diagnostic PSG followed by CPAP titration during PSG on the same night) is an alternative to one full night of diagnostic PSG followed by a second night of titration if the following four criteria are met:

    a. An apnea-hypoapnea index (AHI) of at least 40 is documented during a minimum of 2 hours of diagnostic PSG. Split-night studies may sometimes be considered at an AHI of 20 to 40, based on clinical judgment (e.g., if there are also repetitive long obstructions and major desaturations). However, at AHI values below 40, determination of CPAP pressure requirements, based on split-night studies, may be less accurate than in full-night calibrations.
    b. CPAP titration is carried out for more than 3 hours (because respiratory events can worsen as the night progresses).
    c. PSG documents that CPAP eliminates or nearly eliminates the respiratory events during REM and non-REM (NREM) sleep, including REM sleep with the patient in the supine position.
    d. A second full night of PSG for CPAP titration is performed if the diagnosis of a SRBD is confirmed but criteria b and c are not met.

A preoperative clinical evaluation that includes polysomnography or an attended cardiorespiratory (Type 3) sleep study is routinely indicated to evaluate for the presence of obstructive sleep apnea in patients before they undergo upper airway surgery for snoring or obstructive sleep apnea. (**Standard**)

Follow-up polysomnography or an attended cardiorespiratory (Type 3) sleep study is routinely indicated for the assessment of treatment results in the following circumstances: (**Standard**)

1. After good clinical response to oral appliance treatment in patients with moderate to severe OSA, to ensure therapeutic benefit. (American Sleep Disorders Association, 1995)
2. After surgical treatment of patients with moderate to severe OSA, to ensure satisfactory response. (American Sleep Disorders Association, 1996)

3. After surgical or dental treatment of patients with SRBDs whose symptoms return despite a good initial response to treatment. (American Sleep Disorders Association, 1996)

Follow-up polysomnography is routinely indicated for the assessment of treatment results in the following circumstances: (**Standard**)

1. After substantial weight loss (e.g., 10% of body weight) has occurred in patients on CPAP for treatment of SRBDs to ascertain whether CPAP is still needed at the previously titrated pressure
2. After substantial weight gain (e.g., 10% of body weight) has occurred in patients previously treated with CPAP successfully, who are again symptomatic despite the continued use of CPAP, to ascertain whether pressure adjustments are needed
3. When clinical response is insufficient or when symptoms return despite a good initial response to treatment with CPAP. In these circumstances, testing should be devised with consideration that a concurrent sleep disorder may be present (e.g., OSA and narcolepsy).

Follow-up polysomnography or a cardiorespiratory (Type 3) sleep study is not routinely indicated in patients treated with CPAP whose symptoms continue to be resolved with CPAP treatment. (**Option**)

A multiple sleep latency test is not routinely indicated for most patients with sleep related breathing disorders. A subjective assessment of excessive daytime sleepiness should be obtained routinely. When an objective measure of daytime sleepiness is also required, previously published practice parameters (Littner et al., 2005) should be consulted. (**Standard**)

Patients with systolic or diastolic heart failure should undergo polysomnography if they have nocturnal symptoms suggestive of sleep related breathing disorders (disturbed sleep, nocturnal dyspnea, snoring) or if they remain symptomatic despite optimal medical management of congestive heart failure. (**Standard**)

Patients with coronary artery disease should be evaluated for symptoms and signs of sleep apnea. If there is suspicion of sleep apnea, the patients should undergo a sleep study. (**Guideline**)

Patients with history of stroke or transient ischemic attacks should be evaluated for symptoms and signs of sleep apnea. If there is suspicion of sleep apnea, the patients should undergo a sleep study. (**Option**)

Patients referred for evaluation of significant tachyarrhythmias or bradyarrhythmias should be questioned about symptoms of sleep apnea. A sleep study is indicated if questioning results in a reasonable suspicion that OSA or central sleep apnea (CSA) syndrome are present. (**Guideline**)

Technical Considerations

The use of polysomnography for evaluating sleep related breathing disorders requires a minimum of the following recordings: EEG, electro-oculogram (EOG),

chin electromyogram (EMG), airflow, arterial oxygen saturation, respiratory effort, and electrocardiogram (ECG) or heart rate. Anterior tibialis EMG is useful to assist in detecting movement arousals and may have the added benefit of assessing periodic limb movements, which coexist with sleep related breathing disorders in many patients (Keenan et al., 1993). (**Standard**)

A cardiorespiratory (Type 3) sleep study requires a minimum of the following four channels: respiratory effort, airflow, arterial oxygen saturation, and ECG or heart rate. (**Standard**)

An attended study requires the constant presence of a trained individual who can monitor for technical adequacy, patient compliance, and relevant patient behavior. (**Guideline**)

Alternative Tools

Oximetry lacks the specificity and sensitivity to be used as an alternative to polysomnography or an attended cardiorespiratory (Type 3) sleep study for diagnosing sleep related breathing disorders. (**Guideline**)

Additionally, oximetry must be used with caution when applied to estimates of increased or decreased probability of OSA (Chesson, Berry, & Pack, 2003).

In-laboratory studies have validated the use of attended cardiorespiratory sleep studies for the diagnosis of sleep related breathing disorders. However, only a few peer reviewed articles specifically examined unattended cardiorespiratory sleep studies. In selected circumstances--for example, for patients with severe symptoms of obstructive sleep apnea (i.e., high-pretest-probability stratification group) and when initiation of treatment is urgent and an attended study is not available--an unattended study may be an alternative based on prior recommendations (Chesson, Berry, & Pack, 2003). However, the routine use of unattended cardiorespiratory studies (or even unattended polysomnography) cannot be supported, at least until there has been clear validation of such studies conducted without a technologist providing ongoing observations and interventions to ensure accurate recording and interpretation. Further research is needed to clarify this issue. (**Guideline**)

No clinical model is recommended for use to predict severity of obstructive sleep apnea (**Option**)

Other Respiratory Disorders

General Evaluation

A clinical history and physical evaluation are needed to establish the presence and severity of the underlying medical disorder.

Additional Validated Stratification Factors

Please refer to the original guideline document for a discussion on additional validated stratification factors.

Clinical Indications for the Use of Polysomnography

For patients with neuromuscular disorders and sleep related symptoms, polysomnography is routinely indicated to evaluate symptoms of sleep disorders that are not adequately diagnosed by obtaining a sleep history, assessing sleep hygiene, and reviewing sleep diaries. (**Standard**)

Polysomnography is not indicated to diagnose chronic lung disease. (**Standard**)

Nocturnal hypoxemia in patients with chronic obstructive, restrictive, or reactive lung disease is usually adequately evaluated by oximetry and does not require PSG. However, if the patient's symptoms suggest a diagnosis of OSA or periodic limb movement sleep disorder, indications for PSG are the same as for those disorders in patients without chronic lung disease.

Technical Considerations

PSG recording for evaluating breathing disorders requires a minimum of EEG, EOG, chin EMG, airflow, arterial oxygen saturation, respiratory effort, and heart rate or electrocardiogram channels. Measurement of end-tidal carbon dioxide is often very important in clarifying the patient's respiratory adequacy. Anterior tibialis EMG is useful to assist in detecting movement arousals and may also allow for the assessment of periodic limb movement sleep disorder, which may coexist with respiratory disorders in many patients.

Alternative Tools

Nocturnal oximetry may be helpful or sufficient in assessing a disorder in which the only or principal clinical issue is the level of hypoxemia and when determining sleep stages or assessing sleep apnea is not necessary. (**Standard**)

Pulmonary function tests and arterial blood gases also may be used to help assess the patient's level of respiratory dysfunction. (**Option**)

Narcolepsy

General Evaluation

A clinical history, sleep diaries, PSG, and a multiple sleep latency test (MSLT) are key items in the evaluation of narcolepsy.

Additional Validated Stratification Factors

There are no additional validated stratification factors.

Clinical Indications for the Use of Polysomnography and Other Sleep Medicine Procedures

Polysomnography and a multiple sleep latency test performed on the day after the polysomnographic evaluation are routinely indicated in the evaluation of suspected narcolepsy. (**Standard**)

Technical Considerations

The minimum channels required for the diagnosis of narcolepsy include EEG, EOG, chin EMG, and ECG. (**Standard**)

Additional cardiorespiratory channels and anterior tibialis recording is recommended because obstructive sleep apnea, upper-airway resistance syndrome, and periodic limb movement sleep disorder are common co-existing conditions in patients with narcolepsy or may be independent causes of sleep fragmentation that lead to short sleep latencies and sleep-onset REM periods. The diagnosis of narcolepsy (or idiopathic hypersomnolence) requires documentation of the absence of other untreated significant disorders that cause excessive daytime sleepiness. (**Option**)

Recommendations for the multiple sleep latency test protocol should be followed whenever possible to allow standardization of the administration of the test. (**Standard**)

Alternative Tools

No alternatives to the polysomnogram and multiple sleep latency test have been validated for making the diagnosis of narcolepsy. Although the maintenance of wakefulness test may be useful in assessing treatment adequacy (by measuring the ability to stay awake), it has not been shown to be as valid as the multiple sleep latency test for confirmation of excessive daytime sleepiness and the demonstration of sleep-onset REM periods. (**Standard**)

Human leukocyte antigen (HLA) typing is not routinely indicated as a replacement for polysomnography and the multiple sleep latency test because human leukocyte antigen typing lacks specificity in the diagnosis of narcolepsy. Its use in providing supplementary information depends on the clinical setting. (**Option**)

Parasomnias and Seizure Disorders

General Evaluation

A clinical history of any parasomnia must describe and characterize the behaviors in detail with special emphasis on age of onset, time of night, frequency, regularity, and duration of episodes. (**Standard**)

Common, uncomplicated, noninjurious parasomnias, such as typical disorders of arousal, nightmares, enuresis, sleeptalking, and bruxism, can usually be diagnosed by clinical evaluation alone. (**Standard**)

A clinical history, neurologic examination, and a routine EEG obtained while the patient is awake and asleep are often sufficient to establish the diagnosis and permit the appropriate treatment of a sleep related seizure disorder. The need for a routine EEG should be based on clinical judgment and the likelihood that the patient has a sleep related seizure disorder. (**Option**)

Additional Validated Stratification Factors

There are no additional validated stratification factors.

Clinical Indications for Polysomnography and Other Sleep Medicine Procedures

Polysomnography, with additional EEG derivations in an extended bilateral montage, and video recording, is recommended to assist with the diagnosis of paroxysmal arousals or other sleep disruptions that are thought to be seizure related when the initial clinical evaluation and results of a standard EEG are inconclusive. (**Option**)

Polysomnography, with additional EEG derivations and video recording, is indicated in evaluating sleep related behaviors that are violent or otherwise potentially injurious to the patient or others. (**Option**)

Polysomnography is indicated when evaluating patients with sleep behaviors suggestive of parasomnias that are unusual or atypical because of the patient's age at onset; the time, duration, or frequency of occurrence of the behavior; or the specifics of the particular motor patterns in question (e.g., stereotypical, repetitive, or focal). (**Guideline**)

Polysomnography may be indicated in situations with forensic considerations, (e.g., if onset follows trauma or if the events themselves have been associated with personal injury). (**Option**)

Polysomnography may be indicated when the presumed parasomnia or sleep related seizure disorder does not respond to conventional therapy. (**Option**)

Polysomnography is not routinely indicated in cases of typical, uncomplicated, and non-injurious parasomnias when the diagnosis is clearly delineated. (**Option**)

Polysomnography is not routinely indicated for patients with a seizure disorder who have no specific complaints consistent with a sleep disorder. (**Option**)

Technical Considerations

The minimum channels required for the diagnosis of parasomnia or sleep-related seizure disorder include sleep-scoring channels (EEG, EOG, chin EMG); EEG using an expanded bilateral montage; and EMG for body movements (anterior tibialis or extensor digitorum). Audiovisual recording and documented technologist observations during the period of study are also essential. (**Option**)

Interpretation of polysomnography with video and extended EEG montage requires skills in both sleep medicine and seizure recognition. Polysomnographers and electroencephalographers who are not experienced or trained in recognizing and interpreting both polysomnographic and electroencephalographic abnormalities should seek appropriate consultation or should refer patients to a center where this expertise is available. (**Option**)

A paper speed of at least 15 mm/second and preferably 30 mm/second is recommended to enhance the recognition of seizure activity. In digital EEG

recordings, the sampling rate must be adequate to identify brief paroxysmal discharges. (**Option**)

Alternative Tools

The diagnosis of a sleep related seizure disorder can often be made with EEG or video EEG recording alone. There is no alternative to PSG for the electrophysiologic diagnosis of the parasomnias noted in the above recommendations (sections 4.4.3.2 and 4.4.3.3 in the original guideline document), e.g., sleep related behaviors that are violent or otherwise potentially injurious to the patient or others and parasomnias that are unusual or atypical because of the patient's age at onset; the time, duration, or frequency of occurrence of the behavior; or the specifics of the particular motor patterns in question.

Restless Legs Syndrome and Periodic Limb Movement Disorder

General Evaluation

The evaluation should include a clinical history and physical examination. A ferritin level, complete blood count, urinalysis, and screening chemistries to assess secondary causes of restless legs syndrome (RLS) (e.g., anemia, uremia) and to rule out other conditions that can mimic RLS or periodic limb movement disorder (PLMD) (e.g., peripheral neuropathies). The clinical history should include bedpartner observation, if possible, with special emphasis on complaints of leg discomfort, the occurrence of leg or body jerks and restless sleep, and reports of insomnia or excessive daytime sleepiness.

Additional Stratification Factors

Please refer to the original guideline document for a discussion on additional validated stratification factors.

Clinical Indications for Polysomnography and Other Sleep Medicine Procedures

Polysomnography is indicated when a diagnosis of periodic limb movement disorder is considered because of complaints by the patient or an observer of repetitive limb movements during sleep and frequent awakenings, fragmented sleep, difficulty maintaining sleep, or excessive daytime sleepiness. (**Standard**)

The diagnosis of PLMD can be established only by PSG. The diagnosis of PLMD requires quantification of PLMs and PLM related arousals, assessment of the impact of the movements upon sleep architecture, and identification and exclusion of other sleep disorders.

Polysomnography is not routinely indicated to diagnose or treat restless legs syndrome, except where uncertainty exists in the diagnosis. (**Standard**)

Technical Considerations

The minimum channels required for the evaluation of periodic limb movements and related arousals include EEG, EOG, chin EMG, and left and right anterior tibialis surface EMG. Respiratory effort, airflow, and oximetry should be used simultaneously if sleep apnea or upper-airway resistance syndrome is suspected to allow a distinction to be made between inherent periodic limb movements and those limb movements associated with respiratory events. (**Standard**)

Intra-individual night-to-night variability exists in patients with periodic limb movement sleep disorder, and a single study might not be adequate to establish this diagnosis. (**Option**)

Alternative Tools

Actigraphy is not indicated for the routine diagnosis, assessment of severity, or management of restless legs syndrome or periodic limb movement sleep disorder. However, it may be useful in the assessment of treatment effects of these disorders. (**Option**)

The suggested immobilization test (SIT) and forced immobilization test (FIT) may be an aid in the diagnosis of restless legs syndrome and for pre- and post-treatment comparisons. (**Option**)

Depression with Insomnia

General Evaluation

A clinical history is essential in establishing the characteristics of the patient's insomnia. A psychiatric evaluation provides information for the diagnosis of depression.

Additional Validated Stratification Factors

Please refer to the original guideline document for a discussion on additional validated stratification factors.

Clinical Indications for Polysomnography and Other Sleep Medicine Procedures

Neither a polysomnogram nor a multiple sleep latency test is routinely indicated in establishing the diagnosis of depression. (**Standard**)

No characteristics of sleep architecture are specific for the diagnosis of depression. A diagnosis of depression does not in and of itself preclude PSG evaluation if the patient's symptoms and history are indicative of a diagnosis that requires PSG evaluation. Other common sleep disorders can also produce fatigue, tiredness, or sleepiness, symptoms that may suggest depression.

Technical Considerations

A number of pharmacologic agents used to treat depression can affect sleep. The clinician must consider these effects when interpreting a polysomnogram or

multiple sleep latency test performed on a patient who takes these medications. (**Guideline**)

Except for those patients who are being evaluated for narcolepsy, patients who have depression and are being evaluated for a coexisting sleep disorder, e.g., a sleep related breathing disorder, usually do not need to stop taking antidepressant medications. Because the diagnosis of narcolepsy is dependent upon the observation of pathologic alterations in REM sleep, however, the outcome of the evaluation may be inaccurate if polysomnography is performed while the patient is taking these REM-altering medications. Although antidepressants can affect sleep architecture in other sleep disorders and may affect the occurrence of parasomnias and periodic limb movements, patients may face significant risks in controlling depression if antidepressant medications are discontinued. In addition, because patients with depression often require the use of antidepressant medications for a long period of time, the results of a study performed with the patient off medications may not be representative of the patient's usual circumstances and sleep symptoms. (**Guideline**)

Alternative Tools

For the diagnosis of depression, with or without insomnia, a variety of other diagnostic psychiatric tests exist.

Circadian Rhythm Sleep Disorders

General Evaluation

A clinical history in conjunction with a multiweek sleep diary should be obtained to assess the consistency and patterns of sleep and to identify details suggesting other etiologies.

Additional Validated Stratification Factors

There are no additional validated stratification factors.

Clinical Indications for Polysomnography and Other Sleep Medicine Procedures

Polysomnography is not routinely indicated for the diagnosis of circadian rhythm sleep disorders. (**Standard**)

Alternative Tools

Actigraphy may be useful in characterizing and monitoring circadian rhythm patterns or disturbances in the following special populations: (a) the elderly and nursing home patients with and without dementia; (b) newborns, infants, children, and adolescents; (c) hypertensive individuals; (d) depressed or schizophrenic patients; and (e) individuals in inaccessible situations (e.g., space flight). (**Option**)

Actigraphy may be a useful adjunct to a clinical history, physical examination, and subjective sleep diary in the evaluation of circadian rhythm disorders in select circumstances.

Serum and urinary melatonin levels and twenty-four hour core body temperature levels have also been used as alternative methods for detecting circadian rhythm disorders in research settings. (**Option**)

Definitions:

Levels of Recommendations

Standard: This is a generally accepted patient-care strategy, which reflects a high degree of clinical certainty. The term standard generally implies the use of Level I Evidence, which directly addresses the clinical issue, or overwhelming Level II Evidence.

Guideline: This is a patient-care strategy, which reflects a moderate degree of clinical certainty. The term guideline implies the use of Level II Evidence or a consensus of Level III Evidence.

Option: This is a patient-care strategy, which reflects uncertain clinical use. The term option implies either inconclusive or conflicting evidence or conflicting expert opinion.

Classification of Evidence

Level I (Grade A Recommendation): Randomized well-designed trials with low alpha and beta error*

Level II (Grade B Recommendation): Randomized trials with high alpha and beta error*

Level III (Grade C Recommendation): Nonrandomized concurrently controlled studies

Level IV (Grade C Recommendation): Nonrandomized historically controlled studies

Level V (Grade C Recommendation): Case series

*Alpha error refers to the probability (generally set at 95% or greater) that a significant outcome (e.g., $p<0.05$) is not a result of chance occurrence. Beta error refers to the probability (generally set at 80 to 90% or greater) that a nonsignificant result (e.g., $p>0.05$) is the correct conclusion of the study or studies. The estimation of beta error is generally the result of a power analysis. The power analysis includes a sample size analysis to project the size of the study population necessary to ensure that significant differences will be observed if actually present.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

References open in a new window

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for selected recommendations (See "Major Recommendations").

In most cases, the recommendations are based on evidence from studies published in peer-reviewed journals. However, where scientific data are absent, insufficient, or inconclusive, recommendations are based upon task force consensus.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

The American Academy of Sleep Medicine (AASM) expects these guidelines to have a positive impact upon the practice of sleep medicine, patient treatment outcomes, and health care costs.

POTENTIAL HARMS

Polysomnography (PSG), even when accurately measured, recorded, and analyzed, may misclassify patients based upon night-to-night variability in measured parameters, the use of different types of leads that may lead to over- or underestimation of events (e.g., use of thermistors vs. nasal cannula), and the vagaries of the clinical definitions of disease.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

These practice parameters define principles of practice that should meet the needs of most adult patients in most situations. These guidelines should not be considered inclusive of all proper methods of care or exclusive of other methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding the propriety of any specific care must be made by the clinician in light of the individual circumstances presented by the patient and the availability of diagnostic and treatment options and resources.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Staying Healthy

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Kushida CA, Littner MR, Morgenthaler T, Alessi CA, Bailey D, Coleman J Jr, Friedman L, Hirshkowitz M, Kapen S, Kramer M, Lee-Chiong T, Loube DL, Owens J, Pancer JP, Wise M. Practice parameters for the indications for polysomnography and related procedures: an update for 2005. Sleep 2005 Apr 1;28(4):499-521. [150 references] PubMed

ADAPTATION

Not applicable: Guideline was not adapted from another source.

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GUIDELINE DEVELOPER(S)

American Academy of Sleep Medicine - Professional Association

GUIDELINE DEVELOPER COMMENT

This guideline has received recognition from the American Medical Association (AMA) for the process of development.

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American Academy of Sleep Medicine

GUIDELINE COMMITTEE

Standards of Practice Committee

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

All members of the Standards of Practice Committee (SPC) and the Board of Directors completed detailed conflict-of-interest statements. The participants in this process may be directors or members of sleep disorders centers and recognize that they participate in sleep-center based studies. However, many additionally have substantial experience with the use of ambulatory equipment for sleep studies. Otherwise, conflicts-of-interest with regard to the actions of the Standards of Practice Committee and the Board were not felt to be present.

Disclosure Statement

Dr. Kushida has received research support from GlaxoSmithKline, Boehringer-Ingelheim, Xenoport, and Pfizer; has received honoraria from GlaxoSmithKline; has received consulting fees from New Millennium Diagnostics, Inc.; and has received royalties as a licensor of a patented oral measurement device from Respironics, Inc. Dr. Littner is the principal investigator in research studies supported by GlaxoSmithKline, AstraZeneca, and Boehringer-Ingelheim; is on the speakers' bureaus for Boehringer-Ingelheim, Novartis, GlaxoSmithKline, and Pfizer; and has received honorarium from Boehringer-Ingelheim. Dr. Morgenthaler has received research support from Itamar Medical and ResMed. Dr. Alessi is a speaker for the Medical Education Speaker's Network; and is a consultant for Prescription Solutions. Dr. Owens has received research support from Eli Lilly, Sepracor, Cephalon, and Sanofi-Aventis; is a speaker for Eli Lilly and Johnson & Johnson; and is a consultant for Eli Lilly, Johnson & Johnson, Sepracor, Cephalon, and Sanofi-Aventis. Dr. Hirshkowitz is a speaker for Sanofi-Aventis and Cephalon; and has received honoraria from Sanofi-Aventis. Dr. Bailey is a partner in Dental Appliance Innovators Inc.; this company developed the NORAD oral appliance. Drs. Friedman, Kapen, Kramer, Lee-Chiong, Loube, Wise, Coleman, and Pancer have indicated no financial conflicts of interest.

GUIDELINE STATUS

This is the current release of this guideline.

This guideline updates a previous version: Practice parameters for the indications for polysomnography and related procedures. Polysomnography Task Force, American Sleep Disorders Association Standards of Practice Committee. Sleep 1997 Jun;20(6):406-22.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the American Academy of Sleep Medicine (AASM) Web site.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

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